NTPL

ALL INDIA TEST SERIES

CODE - A

TEST ID 001929

JEE (Advanced) - 2019

FULL TEST - 3 (Paper-I)

Time : 3 Hours ***Maximum Marks : 186***

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

A. General :

1. This booklet is your Question Paper containing **54 questions**.
2. The Question Paper **CODE & TEST ID** is printed on the right hand top corner of this booklet. This should be entered on the OMR Sheet.
3. Fill the bubbles completely and properly using a **Blue/Black Ball Point Pen** only.
4. No additional sheets will be provided for rough work.
5. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers, and electronic gadgets in any form are not allowed to be carried inside the examination hall.
6. The answer sheet, a machine-readable Optical mark recognition sheet (OMR Sheet), is provided separately.
7. DO NOT TAMPER WITH / MUTILATE THE OMR OR THE BOOKLET.
8. Do not break the seals of the question-paper booklet before being instructed to do so by the invigilator.

B. Question Paper Format :

9. The question paper consists of **3 parts (Part I: Physics, Part II: Chemistry & Part III: Maths)**. Each part has **3 sections**.
10. **Section I** contains **5 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), for its answer, out of which ***ONLY ONE*** is correct.
11. **Section II** contains **8 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D), for its answer, out of which ***ONE OR MORE*** is/are correct.
12. **Section III** contains **5 questions**. The answer to each question is a **single digit integer**, ranging from 0 to 9 (both inclusive).

C. Marking Scheme :

13. For each question in **Section I**, you will be **awarded 3 marks** if you darken the bubble(s) corresponding to the correct choice(s) for the answer, and **zero mark** if no bubble is darkened. In all other cases, **minus one (-1) mark** will be awarded.
14. For each question in **Section II,** you will be awarded **4 marks** if one the bubble(s) corresponding to the correct option(s) is(are) darkened, and **+1 marks** for darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened. In all other cases, **minus one (-2) marks** will be awarded. **Zero marks** If none of the bubbles is darkened.
15. For each question in **Section III**, you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY**. In all other cases **zero (0) marks** will be awarded. **No negative marks** will be awarded for incorrect answer in this section.

Name of the Candidate (in Capitals) _____

Test Centre _____ Centre Code _____

Candidate's Signature _____ Invigilator's Signature _____

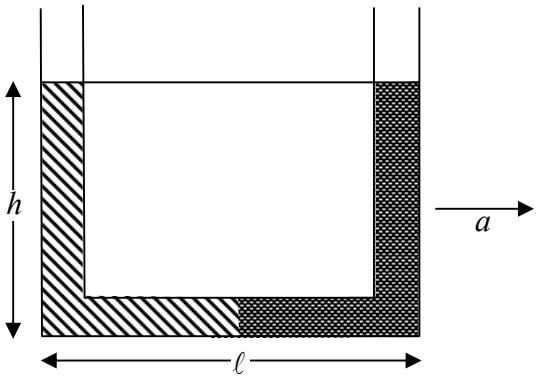
PART I : PHYSICS

SECTION 1 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	If one the bubble corresponding to the correct option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–1	In all other cases

1. A U-tube of base length ℓ filled with same volume of two liquids of densities ρ and 2ρ is moving with an acceleration a on the horizontal plane. If the height difference between the two surfaces (open to atmosphere) becomes zero, then the height h is given by



(a) $\frac{a}{2g}\ell$ (b) $\frac{3a}{2g}\ell$

(c) $\frac{a}{g}\ell$ (d) $\frac{2a}{3g}\ell$

2. An object is moving in the xy plane with the position as a function of time by $\vec{r} = x(t)\hat{i} + y(t)\hat{j}$. Point O is at $\vec{r} = 0$. The distance of object from O is definitely decreasing when

(a) $v_x > 0, v_y > 0$ (b) $v_x < 0, v_y < 0$ (c) $xv_x + yv_y < 0$ (d) $xv_x + yv_y > 0$

3. In the figure shown S_0 is a monochromatic source of light emitting light of wavelength λ (in air). Light falls on slit S from S_0 and then reach the slits S_1 and S_2 through a medium of refractive index μ_1. Light from slits S_1 and S_2 reach the screen through medium of refractive index μ_3.

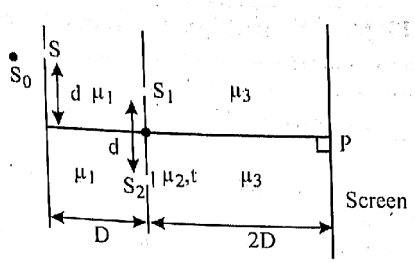
A thin transparent film of refractive index μ_2 and thickness t is placed in front of S_2. Point P is symmetrical w.r.t. S_1 and S_2. Using the values $d = 1mm, D = 1m, \mu_1 = 4/3, \mu_2 = 3/2, \mu_3 = 9/5$ and $t = (4/9)\times 10^{-5} m$. The distance of central maxima from P is

(a) 1 mm

(b) 0

(c) 2mm

(d) 0.5 mm



4. When a galvanometer is shunted with a 4Ω resistance, the deflection is reduced to one-fifth. If the galvanometer is further shunted with a 2Ω wire, the further reduction in the deflection will be (the main current remains the same).

(a) $(8/13)$ of the deflection when shunted with 4Ω only

(b) $(5/14)$ of the deflection when shunted with 4Ω only

(c) $(3/4)$ of the deflection when shunted with 4Ω only

(d) $(3/13)$ of the deflection when shunted with 4Ω only

5. Two vibrating strings of the material but length L and 2L have radii 2r and r respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental modes, the one of length L with frequency v_1 and the other with frequency v_2. The ratio v_1/v_2 is given by:

(a) 2 (b) 4 (c) 8 (d) 1

SECTION 2 (Maximum Marks : 32)

- This section contains **EIGHT** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct.
- For each question, darken the bubble(s) corresponding to the correct option(s) in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If one the bubble(s) corresponding to the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–2	In all other cases.

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

6. During an experiment, an ideal gas is found to obey a condition $\frac{P^2}{\rho}=$ constant [$\rho=$ density of the gas]. The gas is initially at temperature T, pressure P and density $\rho.$ and density $\rho.$ The gas expands such that density changes to $\rho/2$

(a) The pressure of the gas changes to $\sqrt{2}p$

(b) The temperature of the gas changes to $\sqrt{2}\,T$

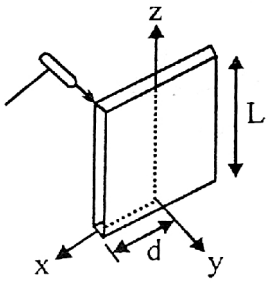
(c) The graph of the above process on the $P-T$ diagram is parabola

(d) The graph of the above process on the $P-T$ diagram is hyperbola

7. Choose the correct options

(a) Three point masses m_1, m_2 and m_3 are located at the vertices of an equilateral triangle of sides 'a' then moment of inertia of the system about an axis along the altitude for the triangle through m_1 is $\left(m_2+m_3\right)\frac{a^2}{4}$

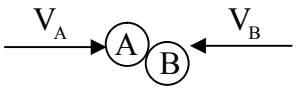
(b) A thin plate of mass M, length L, and width 2d is mounted vertically on a frictionless fixed axle along the z-axis, as shown initially the object is at rest. It is then tapped with a hammer to provide a torque $\tau,$ which produces an angular impulse H about the z-axis of magnitude $H=\int\tau\,\mathrm{dt}$ then the angular speed ω of the plate about the z-axis after the tap is $\frac{3H}{Md^2}.$



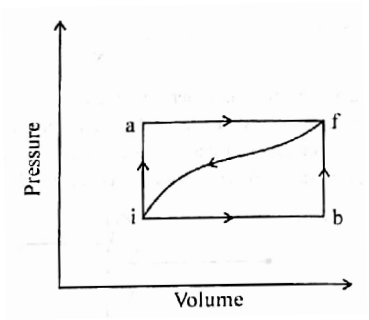
(c) If a particle of mass m_1 is located at $\left(x,y,z\right)=\left(0,a,0\right)$ and a second particle of mass m_2 is located at $\left(x,y,z\right)=\left(b,c,0\right),$ then the location of their centre of mass is $\left(\frac{m_2b}{m_1+m_2},\frac{m_1a+m_2c}{m_1+m_2},0\right)$

(d) Two bodies A and B, collide as shown in figure a and b, they exert equal and opposite forces on each other in (a) but not in (b).

(i) 

(ii) 

8. When a sample of a gas is taken from *i* to state *f* along the path *iaf* , heat supplied to the gas is 50 cal and work done by the gas is 20 cal. If it is taken by path *ibf* , then heat supplied is 36 cal. Then choose the correct options



(a) Work done by the gas along path *ibf* is 6 cal

(b) If work done upon the gas is 13 cal for the return path 'fi', then heat rejected by the gas along path 'fi' is 43 cal

(c) If internal energy of the gas at state i is 10 cal, then internal energy at state 'f' is 40cal

(d) If internal energy at status 'b' is 22 cal and at 'i' is 10 cal then heat supplied to the gas along path 'ib' is 18 cal

9. Which of the following are not dependent on the intensity (keeping frequency constant) of the incident radiation in a photoelectric experiment

(a) Amount of photoelectric current

(b) Stopping potential to reduce the photoelectric current to zero

(c) Work function of the surface

(d) Maximum kinetic energy of photoelectrons

10. A particle is projected vertically upwards in absence of air resistance with a velocity u from a point O. When it returns to the point of projection

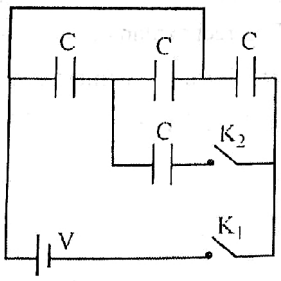
(a) Its average velocity is zero

(b) Its displacement is zero

(c) Its average speed is $u/2$

(d) Its average speed is u

11. How does the total energy stored in the capacitors in the circuit shown in the figure change when first switch K_1 is closed (process – 1) and then switch K_2 is also closed (process-2). Assume that all capacitors were initially uncharged



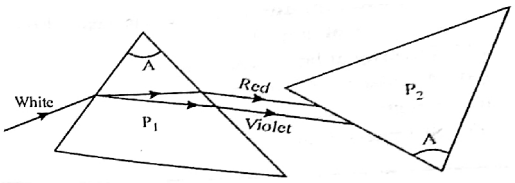
(a) Increases in process – 1

(b) Increases in process – 2

(c) Decreases in process – 2

(d) Magnitude of change in process – 2 is less that in process – 1

12. P_1 and P_2 are identical prisms arranged as shown in figure. A ray of white light incident of face of P_1 undergoes dispersion and falls on one face of P_2. The facing surfaces of the prisms are parallel to each other. Then



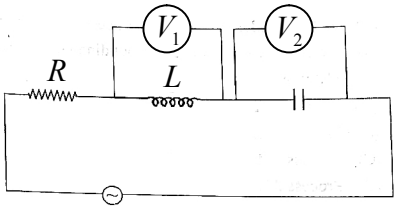
(a) Light emerging from P_2 will be white

(b) In the light emerging from P_2 dispersion will be greater

(c) The direction of light emerging from P_2 will be parallel to the direction of ray incident on P_1

(d) The ray emerging from P_2 will be white even if prisms P_1 and P_2 have identical geometry but different material

13. In the circuit shown, resistance $R = 100\,\Omega$, inductance $L = \frac{2}{\pi} H$ and capacitance $C = \frac{8}{\pi}\mu F$ are connected in series with an ac source of 200 volt and frequency f. If the readings of he hot wire voltmeters V_1 and V_2 are same then



(a) $f = 250\,\pi\,Hz$

(b) $f = 125\,Hz$

(c) current through R is 2A

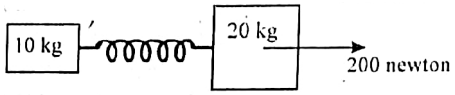
(d) $V_1 = V_2 = 1000$ volt

SECTION 3 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	If one the bubble corresponding to the correct option is darkened.
Zero Marks	:	0	In all other cases.

14. The masses of 10 kg and 20 kg respectively are connected by a massless spring in fig. A force of 200 newton acts on the 20 kg mass. At the instant shown, the 10 kg mass has acceleration 12 m/sec^2. What is the acceleration (in m/s^2) of 20 kg mass?

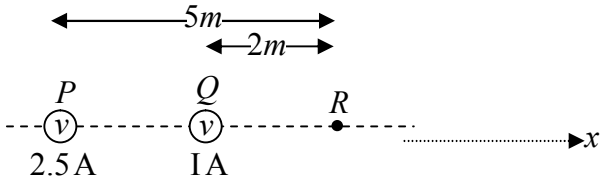


15. A particle is moving on .x-axis has potential energy $U = 2 - 20x + 5x^2$ joules along x-axis. The particle is released $x = -3$. If the mass of the particle is 0.1 kg, then find how many times of Ten is the maximum velocity (in m/s) of the particle.

16. The length of a wire between the two ends of a sonometer is 105cm. If the sum of the distances of the positions of the two bridges from one end is expressed as (182–x) cm so that the fundamental frequencies of the three segments are in the ratio of 1 : 3 : 15. Find the value of x.

17. A brass rod of length 50 cm and diameter 3.0 mm is joined to a steel rod of the same length and diameter. If the change in length of the combined rod at 250°C is $\left(A \times 10^{-2}\right)$cm, given the original lengths are at 40.0°C, what is the sum of digits of A before decimal places? The ends of the rod are free to expand (Co-efficient of linear expansion of brass $= 2.0 \times 10^{-5}\, K^{-1}$, steel $= 1.2 \times 10^{-5}\, K^{-1}$).

18. Two long parallel wires carrying current 2.5 amperes and I ampere in the same direction (directed into the plane of the paper) are held at P and Q respectively such that they are perpendicular to the plane of paper. The points P and Q are located at a distance of 5 metres and 2 metres respectively from collinear point R (see figure). An electron moving with a velocity of $4 \times 10^5\, m/s$ along the positive x-direction experiences a force of magnitude 3.2×10^{-20} N at the point R. Find the value of I (in ampere).



PART II : CHEMISTRY

SECTION 1 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	If one the bubble corresponding to the correct option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–1	In all other cases

19. Boron cannot form which of the following anions:

(a) BF_6^{3-} (b) BF_4^- (c) $B(OH)_4^-$ (d) BO_2^-

20. Which of the following resonating structures of 1-methoxy-1,3-butadiene is most stable:

(a) $\overset{(-)}{C}H_2 - CH = CH - CH = \overset{\oplus}{O} - CH_3$ (b) $CH_2 = CH - \overset{(-)}{C}H - CH = \overset{\oplus}{O} - CH_3$

(c) $CH_2 = CH - \overset{\oplus}{C}H - \overset{(-)}{C}H - O - CH_3$ (d) $CH_2 = CH - \overset{(-)}{C}H - \overset{\oplus}{C}H - O - CH_3$

21. A mixture of two salts is not water soluble but dissolves completely in dilute HCl to form a colourless solution. The mixture could be

(a) $AgNO_3$ and KBr (b) $BaCO_3$ & ZnS

(c) $FeCl_3$ and $CaCO_3$ (d) $Mn(NO_3)_2 + MgSO_4$

22. The weight of a residue obtained by heating 2.76 g of silver carbonate is :

(a) 2.76 g (b) 2.98 g (c) 2.16 g (d) 2.44 g

23. The brown ring complex $[Fe(H_2O)_5NO]SO_4$ has oxidation number of Fe

(a) +1 (b) +2 (c) +3 (d) +4

SECTION 2 (Maximum Marks : 32)

- This section contains **EIGHT** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct.
- For each question, darken the bubble(s) corresponding to the correct option(s) in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If one the bubble(s) corresponding to the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–2	In all other cases.

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

24. If P° and P_S are the V.P. of solvent and its solution respectively and N_1 and N_2 are the moles of solute and solvent then

(a) $(P° - P_S)/P° = N_1/(N_1 + N_2)$ (b) $(P° - P_s)/P_S = N_1/N_2$

(c) $(P° - P_S)/P° = N_1/N_2$ (d) None

25. Select the correct statements:

(a) For the reaction $H_{2(g)} + I_{2(g)} \underset{K_b}{\overset{K_f}{\rightleftharpoons}} 2HI(g)$; $\frac{d[H_2]}{dt} = K_b[HI]^2$ (Assuming the reactions to be elementary)

(b) At equilibrium net rate of change in conc. of H_2 is zero for $H_2 + I_2 \rightleftharpoons 2HI$

(c) The equilibrium constant for the reaction $H_{2(g)} + I_{2(g)} \underset{K_b}{\overset{K_f}{\rightleftharpoons}} 2HI$; is independent of temperature

(d) (a) is correct and (b) is wrong

26. Ground state of nitrogen atom can be represented by

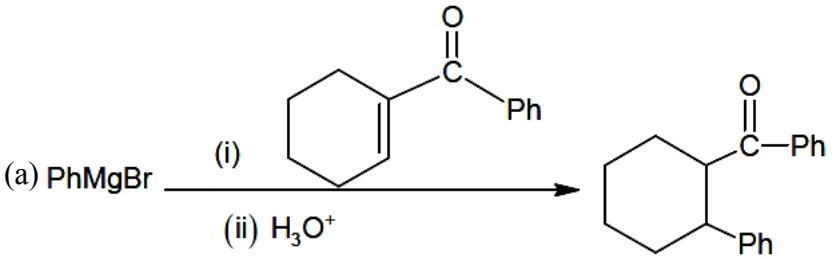
(a)  (b) 

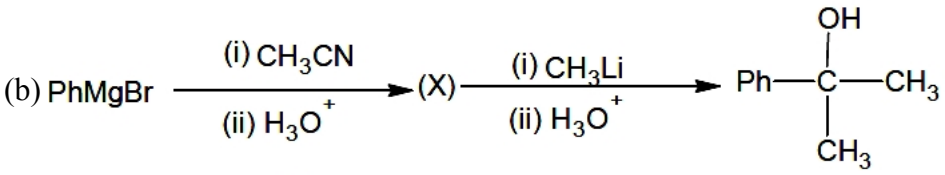
(c)  (d) 

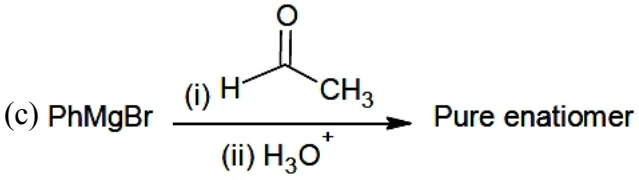
27. Radioactive $\left(\overset{82}{Br}-\overset{82}{Br}\right)$ adds to 1-bromocyclohexene in CCl_4. The product is :

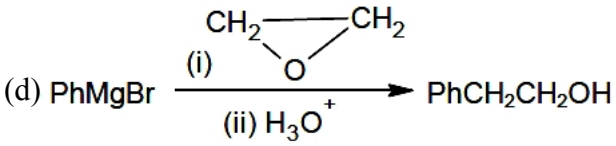
(a) 1, 1, 2 – tribromocyclohexane
(b) has radioactive bromine in vicinal position
(c) has radioactive bromine trans to each other
(d) has radioactive bromine cis to each other

28. Which of the following reactions are correctly matched with products (major)?









29. For $I_2 + 2e^- \rightarrow 2I^-$, standard reduction potential = +0.54 volt.

For, $2Br^- \rightarrow Br_2 + 2e^-$, standard oxidation potential = – 1.09 volt

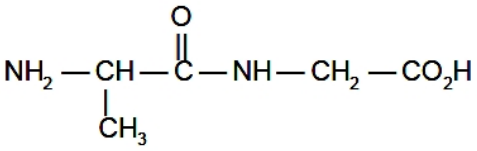
For, $Fe \rightarrow Fe^{2+} + 2e^-$, standard oxidation potential = +0.44 volt

Which of the following actions are spontaneous:

(a) $Br_2 + 2I^- \rightarrow 2Br^- + I_2$
(b) $Fe + Br_2 \rightarrow Fe^{2+} + 2Br^-$
(c) $Fe + I_2 \rightarrow Fe^{2+} + 2I^-$
(d) $I_2 + 2Br^- \rightarrow 2I^- + Br_2$

30. Which of the following will respond to positive chromyl chloride test?

(a) $CuCl_2$ (b) $ZnCl_2$ (c) $HgCl_2$ (d) AgCl

31. 

Identify the amino acids obtained by hydrolysis of the above compound :

(a) Glycine (b) Phenylalonine (c) Alanine (d) Glutamic acid

SECTION 3 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks : +3 If one the bubble corresponding to the correct option is darkened.

Zero Marks : 0 In all other cases.

32. The total number of cyclic, structural isomers for a compound with molecular formula C_5H_{10} is ____.

33. The equivalent weight of $Zn(OH)_2$ in the following reaction is equal to its M/x :

$Zn(OH)_2 + HNO_3 \rightarrow Zn(OH)(NO_3) + H_2O$

X is equal to _____.

34. The number of ions formed when cuprammonium sulphate is dissolved in water is _____.

35. How many visible lines are emitted during transition from 5^{th} orbit to ground state in hydrogen emission spectrum?

36. The half life of two samples of a substance is 50 sec and 200 sec at 0.4 M and 0.1M concentrations, respectively the order of reaction is _____.

PART III : MATHS

SECTION 1 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	If one the bubble corresponding to the correct option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–1	In all other cases

37. If the roots of the equation $(a-1)(x^2+x+1)^2=(a+1)(x^4+x^2+1)$ are real and distinct then the value of $a \in$

(a) $(-\infty, 3]$ (b) $(-\infty, -2)\cup(2, \infty)$ (c) $[-2, 2]$ (d) $[-3, \infty)$

38. Let $x=\sin 1°,$ then the value of the expression

$$\frac{1}{\cos 0°\cdot\cos 1°}+\frac{1}{\cos 1°\cdot\cos 2°}+\frac{1}{\cos 2°\cdot\cos 3°}+...+\frac{1}{\cos 44°\cdot\cos 45°}$$ is equal to

(a) x (b) $1/x$ (c) $\sqrt{2}/x$ (d) $x/\sqrt{2}$

39. Let A be the set of first 16 natural numbers. Then the number of ways of selecting 3 numbers from A such that they are all consecutive or none of them are consecutive is:

(a) 364 (b) 378 (c) 381 (d) None of these.

40. The coefficient of x^{50} in the expression $(1+x)^{100}+2x(1+x)^{99}+3x^2(1+x)^{98}+...+101.x^{100}$ is:

(a) ${}^{102}C_{50}$ (b) ${}^{102}C_{51}$ (c) ${}^{105}C_{50}$ (d) ${}^{105}C_{49}$.

41. The line $x/3+y/4=1$ meets the y-and x-axis at A and B, respectively. A square ABCD is constructed on the line segment AB away from the origin. The coordinates of the vertex of the square farthest from the origin are:

(a) (7, 3) (b) (4, 7) (c) (6, 4) (d) (3, 8)

SECTION 2 (Maximum Marks : 32)

- This section contains **EIGHT** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct.
- For each question, darken the bubble(s) corresponding to the correct option(s) in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+4	If one the bubble(s) corresponding to the correct option(s) is(are) darkened.
Partial Marks	:	+1	For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
Zero Marks	:	0	If none of the bubbles is darkened.
Negative Marks	:	–2	In all other cases.

- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks; darkening only (A) and (D) will result in +2 marks; and darkening (A) and (B) will result in –2 marks, as a wrong option is also darkened.

42. If $f(x) = g(x) + g(2b - x), -b \le x \le 3b$ and $g(x)$ exist $\forall x \in [-b, 3b]$, then:

(a) $x = b$ is a critical point for $f(x)$ (b) $f(x)$ is symmetric about the line $x = b$

(c) $f(x)$ is symmetric about the line $x = 2b$ (d) none of these.

43. The plane containing the line $\frac{x-3}{2} = \frac{y-b}{6} = \frac{z-1}{8}$ passes through the points (a, 3, 2), (2, 1, 4) and (2, 1, 1), then:

(a) such a plane is unique (b) $3a + b = 12$

(c) plane is parallel to z axis (d) there are infinite such planes.

44. If $I = \int \sqrt{\frac{x}{a^3 - x^3}}\,dx = A \sin^{-1}\left(\frac{x^{3/2}}{B}\right) + c$, then:

(a) $A = \frac{2}{3}$ (b) $B = a^{3/2}$ (c) $A = \frac{1}{3}$ (d) $B = a^{1/2}$

45. Let $f(n) = \begin{vmatrix} n & n+1 & n+2 \\ {}^{n}P_{n} & {}^{n+1}P_{n+1} & {}^{n+2}P_{n+2} \\ {}^{n}C_{n} & {}^{n+1}C_{n+1} & {}^{n+2}C_{n+2} \end{vmatrix}$, where the symbols have their usual meanings. The $f(n)$ is divisible by:

(a) $n^2 + n + 1$ (b) $(n+1)!$ (c) $n!$ (d) none of these.

46. $\int \frac{\sin 2x}{\cos^2 x + 5\sin^2 x} dx = \lambda_1 \log\left(\lambda_2 \cos^2 x + \lambda_3 \sin^2 x\right) + \lambda_4$, then

(a) $\lambda_1 = \frac{1}{4}, \lambda_2 = 1$ (b) $\lambda_2 = 5,\ \lambda_3 = 1$ (c) $\lambda_3 = 5, \lambda_1 = \frac{1}{4}$ (d) $\lambda_4 > 0$

47. If P_1, P_2, P_3 denote the distances of the plane $2x - 3y + 4z + 2 = 0$ from the planes $2x - 3y + 4z + 6 = 0$, $4x - 6y + 8z + 3 = 0$ and $2x - 3y + 4z - 6 = 0$ respectively, then

(a) $P_1 + 8P_2 - P_3 = 0$ (b) $P_3 = 16P_2$

(c) $8P_2 = P_1$ (d) $P_1 + 2P_2 + 3P_3 = \sqrt{29}$

48. A vector **d** is equally inclined to three vectors $\mathbf{a} = \hat{\mathbf{i}} - \hat{\mathbf{j}} + \hat{\mathbf{k}}$, $\mathbf{b} = 2\hat{\mathbf{i}} + \hat{\mathbf{j}}$ and $\mathbf{c} = 3\hat{\mathbf{j}} - 2\hat{\mathbf{k}}$. Let **x, y, z** be three vectors in the plane of **ab; bc; ca,** respectively. Then,

(a) $\mathbf{z} \cdot \mathbf{d} = 0$ (b) $\mathbf{x} \cdot \mathbf{d} = 1$

(c) $\mathbf{y} \cdot \mathbf{d} = 32$ (d) $\mathbf{r} \cdot \mathbf{d} = 0$, where $\mathbf{r} = \lambda\mathbf{x} + \mu\mathbf{y} + \gamma\mathbf{z}$

49. Let z_1 and z_2 be two distinct complex numbers and let $z = (1-t)z_1 + tz_2$ for some real number t with $0 < t < 1$. If arg(w) denotes the principal argument of a non zero complex number w, then:

(a) $|z - z_1| + |z - z_2| = |z_1 - z_2|$ (b) $(z - z_1) = (z - z_2)$

(c) $\begin{vmatrix} z - z_1 & \bar{z} - \bar{z}_1 \\ z_2 - z_1 & \bar{z}_2 - \bar{z}_1 \end{vmatrix} = 0$ (d) $\arg(z - z_1) = \arg(z_2 - z_1)$

SECTION 3 (Maximum Marks : 15)

- This section contains **FIVE** questions.
- The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
- For each question, darken the bubble corresponding to the correct integer in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	If one the bubble corresponding to the correct option is darkened.
Zero Marks	:	0	In all other cases.

50. If $|z+2-i|=5$ and maximum value of $|3z+9-7i|$ is M, then the value of M/4 is___

51. The largest value of x for which the fourth term in the expansion, $\left(5^{\frac{2}{5}\log_5\sqrt{4^x+44}}+\frac{1}{5^{\log_5\sqrt{2^{x-1}+7}}}\right)^8$ is 336 is

52. If $\lim_{x\to 0}\frac{1+a\cos 2x+b\cos 4x}{x^4}$ exists for all $x\in R$ and has the value equal to c, then the value of $[a^{-1}+b^{-1}+c^{-1}]$ is (where [.]denotes the greatest integer function).

53. Let $y=y(t)$ be a solution to the differential equation $y'+2ty=t^2$, then the value of $\lim_{t\to\infty}\frac{t}{y}$ is.

54. The value of

$$\int_0^1 4x^3\left\{\frac{d^2}{dx^2}\left(1-x^2\right)^5\right\}dx$$

is

SOLUTION OF AITS JEE (ADVANCED) FULL TEST – 3

PHYSICS

1.	**(b)**	2.	**(c)**	3.	**(b)**	4.	**(a)**
5.	**(d)**	6.	**(b), (d)**	7.	**(a), (b), (c)**	8.	**(a), (b), (c), (d)**
9.	**(b), (c), (d)**	10.	**(a), (b), (c)**	11.	**(a), (b), (d)**	12.	**(a), (c)**
13.	**(b), (c)**	14.	**(4)**	15.	**(5)**	16.	**(7)**
17.	**(6)**	18.	**(4)**				

CHEMISTRY

19. **(a)**

Due to non availability of d-orbitals, boron is unable to expand its octet. Therefore it cannot extend its covalency more than 4.

20. **(b)**

21. **(b)**

$BaCO_3 + 2HCl \rightarrow BaCl_2 + H_2O + CO_2$

$ZnS + 2HCl \rightarrow ZnCl_2 + H_2S$

22. **(c)**

$2Ag_2CO_3 \xrightarrow{\Delta} 4\,Ag + 2CO_2 + O_2$

552 gm $Ag_2CO_3 \rightarrow$ 432 g of Ag

$\therefore$ 2.76 g $Ag_2CO_3 \rightarrow \frac{432}{552} \times 2.76 = 2.16$ g

23. **(a)**

NO in iron complex has +1 oxidation number.

Thus, $a + 5 \times (0) + 1 + 1 \times (-2) = 0$

$\therefore\ a = +1$

24. **(a), (b)**

Roult's law for ideal solutions can be represented in the above two given ways.

25. **(a), (b)**

26. **(a), (d)**

Hund's rule.

27. **(a), (b), (c)**

Addition of Br_2 in CCl_4 is anti addition.

28. **(a), (b), (d)**

In case of (C) racemic mixture is obtained.

29. **(a), (b), (c)**

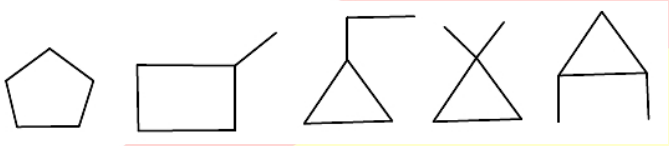
30. **(a), (b)**

Fact $\rightarrow$ Chromyl chloride test is not given by chlorides of Hg, Sn, Ag, Pb and Sb.

31. **(a), (c)**

$$NH_2-\underset{\underset{CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-NH-CH_2-CO_2H \xrightarrow{\text{hydrolysis}} \underset{\underset{CH_3}{|}}{NH_2-CH-COOH}\ (\text{Alanine}) \ + \ \underset{\text{Glycine}}{H_2N-CH_2-COOH}$$

32. **(5)**



33. **(1)**

$$\text{E.W.} = \frac{\text{M.W}}{\text{acidity}}$$

$Zn(OH)_2$ can replace only one OH.

34. **(2)**

$$\left[Cu(NH_3)_4\right]SO_4 \rightleftharpoons \left[Cu(NH_3)_4\right]^{2+} + SO_4^{2-}$$

35. **(3)**

$$\frac{(n_2-n_1)(n_2-n_1+1)}{2}$$

36. **(2)**

$$\text{rate} \propto \frac{1}{[A]}$$

MATHS

37. **(b)**

38. **(b)**

$$\frac{1}{\sin 1^\circ}\left[\frac{\sin(1^\circ-0^\circ)}{\cos 0^\circ\cos 1^\circ}+\frac{\sin(2^\circ-1^\circ)}{\cos 1^\circ\cos 2^\circ}+\frac{\sin(3^\circ-2^\circ)}{\cos 2^\circ\cos 3^\circ}+\ldots+\frac{\sin(45^\circ-44^\circ)}{\cos 44^\circ\cos 45^\circ}\right]$$

$$=\frac{1}{\sin 1^\circ}\left[\tan 1^\circ+(\tan 2^\circ-\tan 1^\circ)+(\tan 3^\circ-\tan 2^\circ)+(\tan 4^\circ-\tan 3^\circ)+\ldots+(\tan 45^\circ-\tan 44^\circ)\right]$$

$$=\frac{1}{\sin 1^\circ}=\frac{1}{x}$$

39. **(b)**

40. **(a)**

41. **(b)**

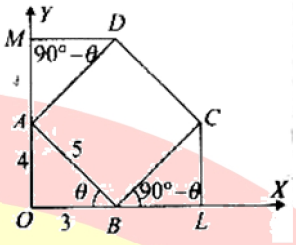
The coordinates of A are (0, 4) and those of B are (3, 0). $BC = AB = \sqrt{3^2 + 4^2} = 5$

or BL = BC $\sin\theta$

and $CL = BC\cos\theta$

or $BL = 5 \times \frac{4}{5} = 4$

and $CL = 5 \times \frac{3}{5} = 3$



Similarly, MD = 4 and AM = 3. So, the coordinates of C are (OB + BL, CL) ≡(7, 3) and those of D are (MD, OA + AM)≡(4, 7).

The coordinates of the vertex farthest from the origin are (4, 7)

42. **(a), (b)**

43. **(a), (b), (c)**

44. **(a), (b)**

45. **(a), (c)**

46. **(a), (c), (d)**

47. **(a), (b), (c), (d)**

48. **(a), (d)**

49. **(a), (b), (d)**

Let $z = \alpha$ be a real root. Then,

$$\alpha^3 + (3+2i)\alpha + (-1+ia) = 0$$

$$\Rightarrow \quad (\alpha^3 + 3\alpha - 1) + i(a + 2\alpha) = 0$$

$$\Rightarrow \quad \alpha^3 + 3\alpha - 1 = 0 \text{ and } \alpha = -a/2 \Rightarrow -\frac{a^3}{8} - \frac{3a}{2} - 1 = 0 \Rightarrow a^3 + 12a + 8 = 0$$

Let $f(a) = a^3 + 12a + 8$

$\therefore \quad f(-1) < 0, f(0) > 0, f(-2) < 0, f(1) > 0 \text{ and } f(3) > 0$

Hence, $a \in (-1, 0)$ or $a \in (-2, 1)$ or $a \in (-2, 3)$

50. **(5)**

$$|3z + 9 - 7i| = |(3z + 6 - 3i) + (3 - 4i)|$$

$$\leq |3z + 6 - 3i| + |3 - 4i|$$

$$= 3|z + 2 - i| + 5 = 20$$

51. **(4)**

52. **(2)**

53. **(2)**

54. **(2)**